

CLAIMS

1. A dial module comprising:
 - a sheet-shaped dial having a design part on a front surface of the dial;
 - a sheet-shaped light source fixed to a back surface of the dial for illuminating the design part; and
 - a flexible printed circuit fixed to a back surface of the light source.
2. The dial module according to claim 1, wherein the dial, light source and flexible printed circuit are formed in substantially the same shape.
3. A dial module comprising:
 - a dial having a design part;
 - a sheet-shaped light source for illuminating the design part; and
 - a flexible printed circuit fixed to a back surface of the light source,wherein the dial is formed on a front surface of the light source.
4. The dial module according to claim 3, wherein the light source and flexible printed circuit are formed in substantially the same shape.
5. A dial module comprising:
 - a sheet-shaped dial having a design part on a front surface of the dial; and
 - a sheet-shaped light source fixed to a back surface of the dial for illuminating the design part,wherein the light source is provided with a flexible printed circuit on a back surface of the light source.
6. The dial module according to claim 5, wherein the dial and light source are formed in substantially the same shape.

7. A dial module comprising a sheet-shaped light source, wherein a dial having a design part is formed on a front surface of the light source while a flexible printed circuit is formed on a back surface of the light source.

5 8. The dial module as claimed in any one of claims 1 – 7, further comprising a connecting terminal part for attaching an additional component thereto.

9. The dial module as claimed in any one of claims 1 – 8, wherein the light source is a sheet-shaped electroluminescent light source.

10 10. A process for manufacturing a dial module comprising:

a first step in which a flexible printed circuit is put and sealed on a back surface of a sheet-shaped light source with an adhesive; and

a second step in which a dial having a design part is printed on a front surface of the light source.

15 11. The process for manufacturing a dial module according to claim 10, wherein the light source is formed by providing a transparent electrically conductive film with a luminous layer, insulating layer and back surface electrode, and the flexible printed circuit is formed by providing a copper foil film with a circuit with etching followed by an insulation
20 processing.

12. A process for manufacturing a dial module comprising:

a first step in which a circuit is formed on a back surface of a sheet-shaped light source by printing an electrically conductive material on the back surface; and

25 a second step in which a dial having a design part is printed on a front surface of the light source.

13. The process for manufacturing a dial module according to claim 12, further comprising a third step in which an insulation processing is applied on a part where the circuit is formed.

14. The process for manufacturing a dial module as claimed in any one of claims 10 - 13, wherein the light source is a sheet-shaped electroluminescent light source.

15. A meter comprising:

the dial module as claimed in any one of claims 1 - 9;

a frame board arranged in front of the dial of the dial module;

a front glass arranged in front of the frame board; and

a casing arranged in the rear of the dial module for fixing the dial module between the frame board and the casing.

16. A light-emitting diode display element for supplying electric power to a light-emitting element, comprising a lead terminal for fixing the light-emitting element to an opposite attaching member situated in the same direction as that of emission from the light-emitting element.

17. A light-emitting diode display element comprising:

a light-emitting element;

an optically transparent member for sealing the light-emitting element, the optically transparent member including a reflecting surface on the side of emission of the light-emitting element and an emitting surface in the rear of the light-emitting element;

a reflecting mirror provided on the reflecting surface, for reflecting the emission from the light-emitting element and guiding out the emission from the emitting surface; and

a lead terminal connected to the light-emitting element, the lead

terminal protruding from a side of the optically transparent member and including an end substantially flush with the emitting surface.

18. A meter comprising:

the dial module as claimed in any one of claims 1 – 9;

5 a first opening formed on a part of the sheet-shaped light source of the dial module;

a second opening formed on a part of the flexible printed circuit of the dial module so as to be lined up with the first opening;

10 the light-emitting diode display element according to claim 16 or 17, in which the lead terminal is connected to the flexible printed circuit and the emission from the light-emitting element is guided to the second opening;

15 a design formed on the sheet-shaped dial and illuminated with the emission from the light-emitting element through the first and second openings;

a frame board arranged in front of the dial of the dial module;

a front glass arranged in front of the frame board; and

a casing arranged in the rear of the dial module for fixing the dial module between the frame board and the casing.

20 19. A display module comprising:

a printed board;

a display element mounted on the printed board;

a driver element mounted on the printed board for driving the display element; and

25 a connecting terminal formed on the printed board.

20. The display module according to claim 19, wherein the display

element is a liquid crystal display element.

21. A meter comprising:

the dial module as claimed in any one of claims 1 – 9;

5 a first notch formed on a part of the sheet-shaped dial of the dial module;

a second notch formed on a part of the sheet-shaped light source of the dial module so as to be lined up with the first notch;

10 a display window formed on a part of the flexible printed circuit of the dial module so as to be situated in the rear of the first and second notches;

the display module according to claim 19 or 20 mounted on the flexible printed circuit so as to be situated at the display window;

a frame board arranged in front of the dial of the dial module;

a front glass arranged in front of the frame board; and

15 a casing arranged in the rear of the dial module for fixing the dial module between the frame board and the casing.

22. A movement module comprising:

a printed board;

a stepper motor mounted on the printed board;

20 a driver element mounted on the printed board for driving the stepper motor; and

a connecting terminal formed on the printed board.

23. A meter comprising:

the dial module as claimed in any one of claims 1 – 9;

25 the movement module according to claim 22 mounted on the flexible printed circuit of the dial module so as to be situated at the

display window;

a frame board arranged in front of the dial of the dial module;

a front glass arranged in front of the frame board; and

a casing arranged in the rear of the dial module for fixing the dial
5 module between the frame board and the casing.

24. A connector module comprising:

a housing including first and second tube parts;

a first connecting terminal penetrating through a bottom of the first
tube part for connecting to an outside connector inside the first tube part,
10 the first connecting terminal being mounted so that a part of the first
connecting terminal is situated inside the first tube part while another
part of the first connecting terminal is exposed to the outside of the first
tube part;

a second connecting terminal penetrating through a bottom of the
15 second tube part, the second connecting terminal being mounted so that a
part of the second connecting terminal is situated inside the second tube
part while another part of the second connecting terminal is exposed to
the outside of the second tube part; and

a circuit board received in the second tube part, the circuit board
20 being detachably connected to the second connecting terminal.

25. The connector module according to claim 24, wherein the part of
the second connecting terminal, which part is situated inside the second
tube part, is a resilient contact.

26. The connector module according to claim 24 or 25 further
25 comprising a cover for closing an opening of the second tube part.

27. A meter comprising:

the dial module as claimed in any one of claims 1 – 9;

the connector module as claimed in any one of claims 24 – 26, in which each of the other parts of the first and second connecting terminals exposed to the outside of the tube part is connected to the flexible
5 printed circuit of the dial module;

a frame board arranged in front of the dial of the dial module;

a front glass arranged in front of the frame board; and

a casing arranged in the rear of the dial module for fixing the dial module between the frame board and the casing.